TRAFFIC ENGINEERING

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A DIGEST OF CURRENT LITERATURE

ON STREET AND HIGHWAY TRAFFIC

and

NEWS OF THE INSTITUTE OF TRAFFIC ENGINEERS

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139. PRELIMINARY RESULTS OF HIGHWAY CAPACITY STUDIES. O. K. Normann, Associate Highway Economist, Bureau of Public Roads (Public Roads, February, 1939)

During the last few years many miles of highway have been reconstructed or replaced, not because they failed structurally, but because they became obsolete through inability to permit the present volumes of traffic to move at reasonable speeds and with freedom from interference between vehicles. Statewide highway planning surveys now being conducted in 46 states will furnish highway engineers with more accurate traffic volume figures and future traffic estimates than they have had in the past, but to make the best possible use of this information, the capacity of various surface widths and types of design and alinement must be known.

The distance spacings as shown in the lower curve of figure 5 are readily computed from the time spacings. The upper curve was constructed by using the average spacings for all vehicles spaced at less than 4 seconds. It was assumed that a car traveling at a spacing greater than 4 seconds was not traveling at minimum spacing but just happened to be going at the same speed as the preceding vehicle. These two curves, therefore, represent the distance spacings that the average driver allows between his vehicle and the vehicle just ahead when following the same speed,and the distance allowed by the largest group of drivers under the same conditions.

It is of interest to know what percentage of these vehicles could have stopped without hitting the preceding vehicle had it stopped suddenly. If it is assumed that the brakes on the following vehicles were as good as those on the leading vehicles and that a ½-second reaction time would be re-

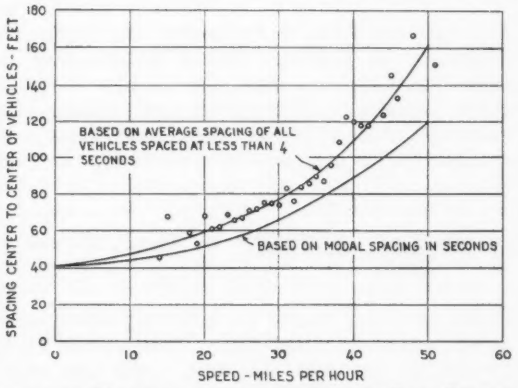

FIGURE 5.—MINIMUM AVERAGE SPACING IN FEET BETWEEN VEHICLES TRAVELING AT THE SAME SPEED. SECTION 3-J, 2-LANE TANGENT.

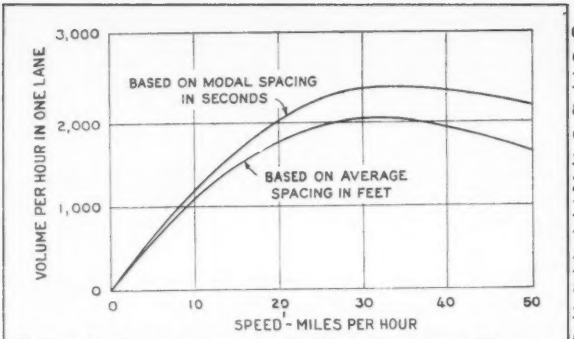

FIGURE 6.—THEORETICAL MAXIMUM TRAFFIC VOLUME WITH ALL VEHICLES TRAVELING AT THE SAME SPEED. SECTION 3-J, 2-LANE TANGENT.

quired, 4.4 per cent of the vehicles could not have avoided rear-end collisions. This figure increases 28 percent for a 1-second reaction time and to 50.5 percent when 1.5 seconds is allowed for a combined perception and reaction time.

Although the possibility of the leading vehicle stopping almost instantaneously, as in the event of a head-on collision, is rather remote, the drivers of 77.3 per cent of the vehicles could not have stopped in time to avoid a rear-end collision or the necessity of swerving to the shoulder or ditch had they suddenly been confronted with such a condition. This assumes a ½-second reaction time, four wheel brakes in perfect order, and the most nonskid type of road surface. These figures illustrate one reason why more than two vehicles are so often involved in one accident.

Using the values shown in figure 5, figure 6 was constructed to show the theoretical maximum number of vehicles per hour that one traffic lane will accommodate at various speeds if all vehicles travel the same speed. The maximum volume occurs at a vehicle speed of 33 miles per hour and does not vary more than 20 percent from this volume for any speed between 20 and 50 miles per hour.

Mr. Normann also discourses at length and with many detailed diagrams on Average Speed Difference Used as an Index of Traffic Congestion; Maximum Hourly Capacities Computed for Various Highways; Regardless of Volume, the Same Percentages of Vehicles Went Slower than the Average Speed; Time Spacing Data Used to Determine Opportunities to Pass.

140. HOW FAST IS SPEED? D. Grant Mickle (Public Safety, March 1939)

There are two steps in the engineering approach to the problems of speed and safety. The first is the determination of the relation between the two, and the second is the selection of means of maintaining that relationship at levels most productive of highway use and service.

Speed as a factor in accidents was particularly dealt with in the 1937 committee report presented by Harry H. Harrison traffic engineer of the Illinois Division of Highways, who headed the committee that year. This report pointed out that speed is a causative factor in accidents,but only in conjunction with other conditions, and even then its major effect is usually in relation to the severity and consequences of impact.

A safe speed may be called that rate of travel at which a driver can operate his car with assurance of safety. There are many conditions affecting and determining safe speed: Sharp grades and curves, short sight distances, faulty road surfaces, intersections, roadside traffic, vehicular controls and lights, driver habits and idiosyncrasies,fog, snow, darkness, and ice, and varying traffic volumes, speeds and units.

Obviously,the reasonable approach to the problem of safety under these conditions is to seek a means of regulating speed in those sections of roadway where accident experience or engineering investigation indicate the need for such regulation. Traffic engineers believe that speed zoning provides such a solution.

Present day speed zones can be established by:

1. The locations or sections of roadway where there are unusual conditions, are identified.
2. Traffic engineering studies are made of all pertinent factors in these sections to determine critical speeds beyond which unusual hazard will exist under average weather and traffic conditions.
3. These determined maximum safe speed values are posted in such a manner that drivers will be certain to see and read them.
4. Adequate police personnel is provided to assure strict and intelligent enforcement of the regulation.

The properly engineered speed zone can be applied effectively to a wide variety of conditions. At the entrances to urban places where it is desirable to adapt the pace of traffic to the different requirements of open highwys, suburban conditions,and residential and business district travel, graduated speed zones are used.On rural sections zoning for speed is useful in inducing traffic to adjust its pace to guard against the hazards of short-sight distances, blind intersections,short sections of imperfect road surface, and the semi-urban traffic of closely built up areas.

It is important to note that in following this policy of combining regulation of speed with other forms of traffic control, the Michigan authorities recognize that speed is im-

portant as one phase only of the complex picture of highway safety.

SUPPLEMENT

141. YOU CAN'T STOP 'EM. R. O. Swain (Texas Parade, March 1939)

We are sure that the speed of today is still out of proportion to human reactions. This is substantiated by the large number of fatalities on our highways and streets. The greater percentage of motor vehicle accidents results from carelessness. It is our contention that speed is not a cause of motor vehicle accidents. Speed contributes to the seriousness of the accidents.

142. THE COMPREHENSIVE PARKWAY SYSTEM OF THE NEW YORK METROPOLITAN REGION. Robert Moses, Commissioner of Parks City of New York, New York (Civil Engineering, March 1939)

Parkway design changes as does every other mode of our restless modern life. The Bronx River Parkway was designed for the automobile of another generation, and that is one reason why it is admittedly outmoded. The proper speed limit is 35 miles per hour within New York City, and 40 miles in the suburban areas. However, I am for the motorists' comfort and safety, and the long-radius curves, superelevation of pavements, and long sight distances make for pleasant motoring. Our engineers always try to avoid curves of smaller radius than 1,500 ft. They bank all curves with a radius of less than 10,000 ft., and they use a minimum sight distance of 1,000 ft.

Because of the increased volume of traffic on the parkways we now place a dividing strip between opposing streams of traffic and make it no less than 6 ft. wide, except across bridges. This center mall minimized headlight glare and provides a safer artery. On the new Belt Parkway, which we hope to make the last word in parkway construction, we are making this dividing strip a minimum of 10 ft. wide, except at bridges. To eliminate interference with through traffic movement, every exit and access is planned with decelerating and accelerating lanes of pavement from 350 to 400 ft. in length. In this distance, we feel that cars can enter or leave a stream of traffic without causing a slowing up of the flow at each access.

Parking for any reason whatsoever is prohibited. Where possible, 8-ft. shoulders are called for to permit disabled

cars to drive off the traveled way. Outside curbs are 3 to 4 in. in height, beveled or rounded, to facilitate driving over them. They are capped with concrete made of white cement to increase their visibility. Inside curves are higher to prevent cars from driving on to the dividing strip.

Concrete pavement is colored by adding to the cement 3 per cent by weight of carbon black. Lane widths are 11 ft. at the outside of the parkway, 12 ft. for the next lane, and in the case of three lanes for traffic going in one direction, 11 ft. for the inside. On this type of parkway, studies have shown that the middle lane is used for passing, hence its greater width.

The parkways are lighted by twin lights of 400 candlepower mounted 23 ft. from the light source to the pavement and spaced 175 ft. on centers. However, complicated clover-leafs should be lighted by general flooding and not conventional parkway luminaires. Parkway lighting is designed to provide only a silhouette of obstacles ahead, and an important part of its value is the path of light it produces. When more than this mass outline is needed for safety of access or exit flood lighting at highmounted height is the solution.

143. SPOTTING THE SORE SPOTS. Oscar M. Gunderson, Traffic Engineer, Michigan State Police (Public Safety, March 1939)

There are a lot of ways to locate traffic sore spots.Among the methods which shall be discussed here are: Spot maps, accident reports, complaints of citizens and organizations, police reports, observance studies and records of activities.

Spot maps are perhaps the best known and most widely used device for discovering any type of concentration. They are one of the most accurate, flexible and simple traffic study mediums available. Accuracy is dependent upon the quality of the accident reports and the scale of the map used. In general police organizations have assigned patrols mistakenly on the basis of all accidents instead of on the basis of accidents which can reasonably be expected to be curtailed by enforcement measures.

Accident reports have been given first consideration in making spot maps, but there is another way of using them which is valuable in locating sore spots. This is the use of accident summaries to show distribution of accidents. The ac cident records of our state are now being made more valuable to us because during 1938 punch-card equipment was installed which enabled us to develop accident information in almost any form desired. This equipment will prove to be of greater

value as time goes on, because of the larger number of reports that will be subject to analysis.

Complaints of citizens, motor clubs, local safety councils suggestions should be carefully considered; for, while their remarks are not technical, they often contain a great deal of common sense.

Observance studies. Concentration of accidents at sore spots in general is more an indication that there is something wrong with the location rather than that violations are more common at the location than elsewhere. Therefore, proper treatment does not lie in enforcement, although it may help, but instead proper treatment is probably of an engineering nature.

144. TRAINING TRAFFIC ENGINEERS. Maxwell N. Halsey, Associate Director, Bureau for Street Traffic Research, Yale University (Yale Scientific Magazine, Winter Issue)

During the past fifteen years the sudden increase in the number and speed of automobiles has placed a new and particularly difficult burden upon the governmental agencies. Many of them have changed their structure and created a new division, called a Traffic Engineering Division, to concentrate upon this problem. The field is still so new that the determination of the best form of governmental organization, and exactly what subjects should be taught those desiring to serve in the capacity of traffic engineer is still in the formative stage.

A minute and detailed knowledge is required of the traffic engineer. He must know everything about: Traffic Signs-, Paint Lines, Traffic Signals, Islands and Intersection Redesign, Street and Highway Lighting, Terminal Facilities, Roadway design, Traffic Planning, Traffic Surveys, Accident Records, Administration and Organization, Economics of Free-Wheel Transportation, Legislation, Education, Enforcement and Courts.

The development of courses for any emerging profession represents slow and painstaking work. Each year the curriculum has improved in its presentation as well as in its coordination with the practical demands of Traffic Engineering, offices.

145. LEST WE REGRET. (Travelers Insurance Company, Hartford Connecticut)

The Travelers Insurance Company has just released their

1939 highway safety booklet entitled "Lest We Regret." It is 6 x 9 inches in size and comprizes 40 pages of a series of stories such as "Hit and Run Home," "Alcohol and Accidents," "Death after Dark," "One Out of Twenty," "The Unseen Force That Kills," "Speed vs. Energy," and it is profusely illustrated with interesting drawings and statistical charts.

One of the highlights is a drawing of a energy meter which shows the number of Danger Units carried at various speeds and is intended to help understand and control the horse-power under the hood of your car.

Another interesting highlight is a graphically illustrated Dollars and Cents chart on the high cost of speeding. This chart summarizes the cost of driving at various speeds. The figures on gasoline and oil consumption and cost, as well as, those on tire cost were developed from data supplied by well-known companies, dealing in these commodities while the figures on maintenance costs are based on experience of large fleets of more than 300 state-owned vehicles. It is curious to note how the costs pile up at increased speeds somewhat after the startling fashion of Danger Units.

This interesting booklet is available gratis to any individual interested in the prevention of automobile accidents. Copies are available through the Travelers offices or by writing directly to the Home Office, in Hartford, Connecticut.

146. PRELIMINARY REPORT OF THE MARYLAND STATE-WIDE HIGHWAY PLANNING SURVEY. Maryland Roads Commission.

The objectives of the survey are to determine the present state of the highways, the volume, kind and distribution of traffic, the adequacy of existing highways and bridges, the annual cost of adquate highways, the extent of use of the various systems by motor vehicle owners in different catagories, and the sources and uses of available highway funds, all to the end that a justifiable program of future highway improvement may be developed.

We are listing the Table of Contents and number of Figures, Inventory Tables, Traffic Tables, Financial Tables, etc.

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The Survey is generously supplied with excellent illustrations in the form of figures, graphs,tables and traffic tables. There are, to be exact, 22 Figures, 8 Inventory Tables, and 10 Traffic Tables, 29 Financial Tables, 2 lists, and 4 maps.

Certain independent studies,such as traffic forecasts, road capacity and truck performance studies are being made by the Bureau of Public Roads. When these studies have been completed the results will be used in establishing better standards for measuring the adequacy of existing improvements, and determining future requirements.

147. LIGHTS WITHOUT WIRES. (Buick Magazine, February, 1939)

Regular illumination was too costly for extensive rural use so Michigan turned to something new in reflectors.

An eighty-five mile stretch of concrete, between Detroit and Lansing is now ribboned along between endless necklaces of glittering beads. These beads are small reflector discs made of a new plastic called Lucite. Mounted in sets of three on a steel post, placed at 100 foot intervals along the highway they sharply define the route for all night drivers. Costing about $25,000 for the 85 mile stretch, they were calculated to take much deadliness out of darkness.

During the first nine months of the installation, U.S.16 from Detroit to Lansing, has been credited with a night accident and fatality decrease of sixty per cent.

Following the success of this device in Michigan, Nevada has installed Lucite reflectors on a ten-mile stretch of the Reno-Carson Highway. Another experiment is planned near Washington, D.C., and still another in North Carolina.

Cost of installing each unit-steel post with three reflector discs-- totals $3.34 on an average. There is, of course, no operating cost.

NEWS ABOUT THE TRAFFIC ENGINEERING PROFESSION

BILL McCONOCHIE. So many favorable comments have come to the Institute headquarters about the 1938 PROCEEDINGS, we can't help but pay tribute to the gentleman who prepared the PROCEEDINGS.

One of the many comments we have received was: "The PROCEEDINGS of your 1938 meeting came to hand this morning and contained much that was of great interest, especially with respect to parking and parking meters.

I congratulate your Institute for the intelligent manner in which the various traffic problems are approached."

ANNUAL BANQUET. The annual banquet of the convention of the Eastern Region of the Institute of Traffic Engineers will be held Monday evening, March 27, at 7 P.M. A fine program has been arranged--Ralph H. Blanchard will speak on "Automobile Insurance and the Traffic Problem;" and the Institute will present another one of its incomparable plays, "Blown Fuses and Cracked Lenses."

Tickets are $2.50 and may be purchased at the convention. Ladies are invited.

DETROIT, MICHIGAN. Mr. M. W. Cochran, Detroit Traffic Engineer, recently asked the Detroit Engineering Society to appoint a committee from their membership to meet with him to discuss vital problems of the Traffic Engineering Bureau. The Board of Directors of the Society selected names for the committee and on February 14 the Detroit City Council approved the following men for membership on the Advisory Committee: S. M. Dean, A. E. Harley, W. A. Lindberg, D. Grant Mickle, R. L. Morrison, A. J. Schamehorn, W. Ray Williams.

At their initial meeting the Committee voted D. Grant Mickle chairman. The first subject of discussion was the menace of illuminated projecting advertising signs in relation to traffic-control signals and means of controlling their use. Other subjects scheduled for early discussion are:

1. Coordination of mass transportation and its relation to vehicular flow on the main thoroughfares.

2. Effective methods of providing off-street parking

facilities.

3. The development of a plan for traffic lane deliveries, involving safe driving speeds and street capacities.

SALT LAKE CITY, UTAH. The Salt Lake City Traffic Commission recently employed Rufus Jasper, Traffic Engineer of the National Safety Council, to make a traffic safety survey in Salt Lake City. Among other recommendations submitted to the City Traffic Commission by Mr. Jasper was one to the effect that a full-time traffic engineer be employed.

Mr. C. G. Wooley of the City Engineer's office has been assigned to carry on future traffic engineering studies.

LEROY E. PEABODY. Mr. Leroy E. Peabody, I.T.E. member, has just been appointed to the City Planning Commission of Alexandria, Virginia.

WORCESTER, MASSACHUSETTS. September 1, 1938 Worcester Police Department inaugurated a 25 per hour campaign. Worcester also announced a "no-fix ticket." Although the campaign was originally set up to run for three months, it proved so successful that it will be continued through 1939. Enforcement index prior to the campaign was running below 1; but since October it has been not less than 9. Personal injury accidents have been cut almost in half; deaths have likewise been reduced.

FLORIDA SAFETY COUNCIL PROGRAM. The Florida Safety Council Conference will be held in Bradenton, Florida at the Dixie Grande Hotel, March 30 and 31, 1939.

TRAFFIC CONTROL PLANNING LECTURES. The University of Buffalo in cooperation with the Planning Research Station of the University and of The City Planning Association offers a series of lectures in Traffic Control Planning. The various phases of the use of traffic control devices, such as signs, signals markings, and islands, as well as the methods that are employed in the location of such equipment, will be considered. Particular emphasis will be placed on such matters as the timing of signals for progressive movement, the control of traffic movement in complicated and irregular sections, the standard application of signs, and analysis of accidents. The instructor is Mr. William B. Powell, Technical Consultant in the United States Bureau of Public Roads; Member of the National Committee for the Standard Codification of Traffic Devices; formerly Traffic Engineer of the City of Buffalo.

These lectures will be held each Friday evening beginning March 3.

ANNUAL CONVENTION OF INSTITUTE OF TRAFFIC ENGINEERS. The Annual Convention will be held in Atlantic City, New Jersey.

The tentative program that has been arranged is:

Saturday, October 14. . . . .Committee Meeting
Sunday, October 15. . . . .Business Session
Monday, October 16. . . . .General Session
Tuesday, October 17. . . . .General Session

I.T.E. MEMBER DEVELOPS A NEW TRAFFIC RECORDING DEVICE. Mr. John Paver, in cooperation with Mr. J. M. Sills, has developed the New Paver-Sills Traficounter, which is now on the market.

There are two models of Traficounters. Traficounter Model A, a permanent or portable automatic recorder, consists of a metal weather and dust proof case, having an upper and lower housing. The upper housing contains the counting, timing and printing mechanism. The lower housing contains the battery--the source of power. This may be used where either direct or alternating current is available. Traficounter Model B, a portable non-recording or visual reading type of counter, consists of a simple counter unit or a multiple of these units mounted in a compact manner in one housing. This latter arrangement is used for counting turning movements where streets have been laned. Traficounter B may be operated with the standard battery or with dry cells. The units comprising these two models are interchangeable, which provides complete flexibility of use.

The detecting device which may be used in conjunction with counters consists of (1) two spring steel plates, housed in a rubber casing, that transmit an electric impulse to the counting unit when pressed together by the wheels of a vehicle and (2) the roadtube which conveys an impulse to the counter when a vehicle passes over it.

The Traficounter Model A prints the cumulative total of counter reading each hour on a paper tape that is advanced by an 8 day clock. Traficounter Model B must be visited at regular periods to secure the record of passing vehicles.

The Traficounters have passed the experimental stages and as disclosed by the various tests made throughout the country they are rugged, economical, easy to use and have a high degree of accuracy. The Bureau of Public Roads in Washington has been cooperating in the designing and testing of this equipment

and they indicate that while counting 300,000 vehicles,at approximately 20,000 to 30,000 per day,the machine count obtained was less than one per cent in error.

ATLANTA, GEORGIA. In December the speed limit in Atlanta,Ga., was changed from 35 to 25 miles per hour. At the end of two months, the results were: Traffic deaths cut from 21 to 5; all traffic accidents down from 1100 to 700; standard motor casualty base rate reduced from $44 to $40.

NEW PUBLICATIONS. (Public Safety, March 1939)

PRINCIPLES OF ROAD ENGINEERING by H. J. Collins and C. A. Hart. (Edward Arnold & Co., London, 1938. Released in the United States through Longmans Green & Co., New York City. Price $18.50. 628 pages)

PRINCIPLES OF ROAD ENGINEERING is a comprehensive discussion of the field of highway engineering including administration and finance, design and construction, highway transport and traffic safety.

Two excellent chapters are devoted to the movement of traffic on the roads and its relation to speed and safety. Safety as a problem of highway engineering is related vividly. The relationship of speed with the highway and of vision with the highway is discussed, intelligently.

Modern highway engineering practices are,of course, similar both abroad and in this country. In reading this book, one gains the impression that American practices and research have influenced road engineering in England.

The engineer who desires a complete reference on highway engineering will find that PRINCIPLES OF ROAD ENGINEERING fills the bill. The book is not prepared as a ready guide to the application of highway engineering practices as found in a laboratory manual. It is rather,a text, evidently intended for the engineering student and highway engineer.

INSTITUTE OF TRAFFIC ENGINEERS

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THE OBJECTIVES OF THE INSTITUTE

The objects of the Institute shall be the advancement of the art and science of traffic engineering, the fostering of traffic engineering education, the stimulation of original research in traffic engineering, the professional improvement of its members, the encouragement of intercourse between men with mutual interests in traffic engineering, and the establishment of a central point of reference and union for its members. (Article I, Section 4 of the Constitution of the INSTITUTE OF TRAFFIC ENGINEERING).

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